1. A town has an initial population of 90000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	89960	89920	89880	89840	89800	89760	89720	89680	89640

A. Exponential

B. Non-Linear Power

C. Linear

D. Logarithmic

E. None of the above

---

2. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 506 grams of element X and after 4 years there is 72 grams remaining.

A. About 1 day

B. About 730 days

C. About 1825 days

D. About 365 days

E. None of the above

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3. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's

temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 130° *C and is placed into a* 11° *C bath to cool. After 19 minutes, the uranium has cooled to* 77° *C.*

A. $k = -0.03568$

B. $k = -0.03102$

C. $k = -0.03816$

D. $k = -0.03758$

E. None of the above

---

4. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 160° *C and is placed into a* 17° *C bath to cool. After 16 minutes, the uranium has cooled to* 113° *C.*

A. $k = -0.04784$

B. $k = -0.03193$

C. $k = -0.04696$

D. $k = -0.02491$

E. None of the above

---

5. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 508 grams of element X and after 4 years there is 50 grams remaining.

A. About 365 days

B. About 365 days

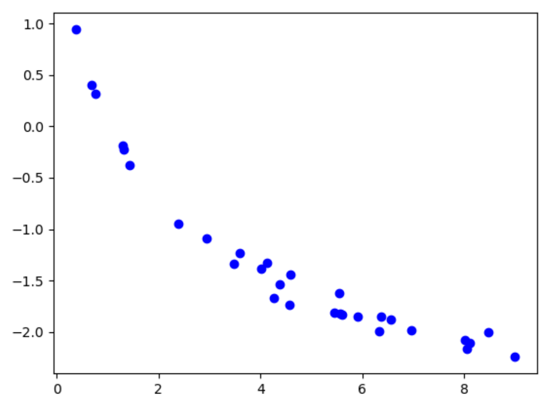
C. About 1 day

D. About 1825 days

E. None of the above

---

6. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Non-linear Power model

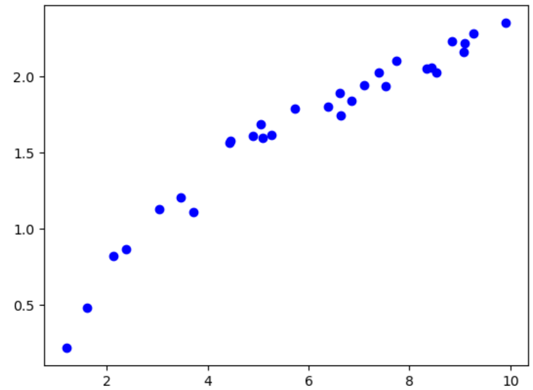
C. Exponential model

D. Linear model

E. None of the above

---

7. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Exponential model

C. Linear model

D. Logarithmic model

E. None of the above

---

8. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 1 hours, the petri dish has 37 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 246 minutes

B. About 29 minutes

C. About 176 minutes

D. About 41 minutes

E. None of the above

---

9. A town has an initial population of 50000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	50040	50080	50120	50160	50200	50240	50280	50320	50360

A. Non-Linear Power

B. Linear

C. Logarithmic

D. Exponential

E. None of the above

---

10. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 3 hours, the petri dish has 9022 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 15 minutes

B. About 35 minutes

C. About 93 minutes

D. About 212 minutes

E. None of the above

---

11. A town has an initial population of 100000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	100000	99979	99967	99958	99951	99946	99941	99937	99934

A. Non-Linear Power

B. Exponential

C. Logarithmic

D. Linear

E. None of the above

---

12. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 808 grams of element X and after 6 years there is 115 grams remaining.

A. About 1 day

B. About 2555 days

C. About 730 days

D. About 1095 days

E. None of the above

---

13. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 150° *C and is placed into a* 15° *C bath to cool. After 16 minutes, the uranium has cooled to* 84° *C.*

A. $k = -0.04195$

B. $k = -0.04481$

C. $k = -0.04403$

D. $k = -0.04853$

E. None of the above

---

14. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $190°$ *C and is placed into a* $12°$ *C bath to cool. After 20 minutes, the uranium has cooled to* $131°$ *C.*

A. $k = -0.03825$

B. $k = -0.06857$

C. $k = -0.03865$

D. $k = -0.02340$

E. None of the above

---

15. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 690 grams of element X and after 6 years there is 69 grams remaining.

A. About 365 days

B. About 730 days

C. About 1 day

D. About 2920 days

E. None of the above

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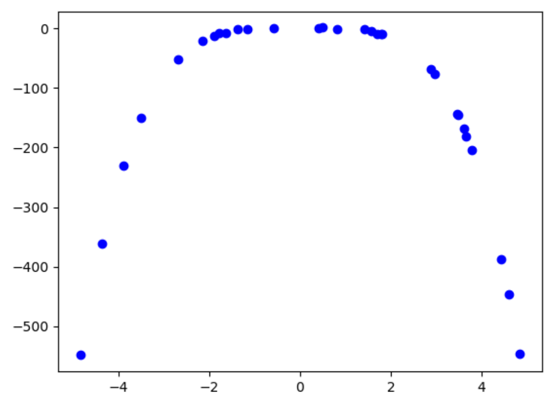
16. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Linear model

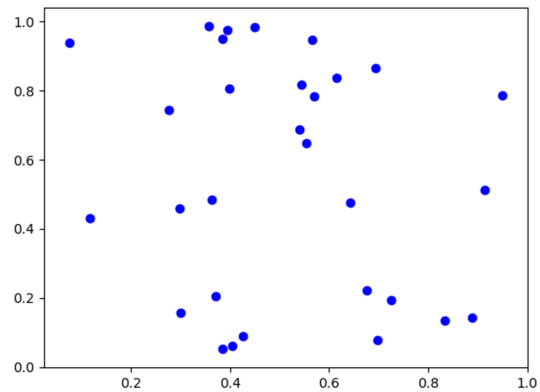
C. Non-linear Power model

D. Exponential model

E. None of the above

---

17. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Exponential model

C. Linear model

D. Logarithmic model

E. None of the above

---

18. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 2 hours, the petri dish has 159 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 214 minutes

B. About 35 minutes

C. About 352 minutes

D. About 58 minutes

E. None of the above

---

19. A town has an initial population of 60000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	59950	59900	59850	59800	59750	59700	59650	59600	59550

A. Logarithmic

B. Linear

C. Exponential

D. Non-Linear Power

E. None of the above

---

20. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 2 hours, the petri dish has 1657 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 79 minutes

B. About 29 minutes

C. About 174 minutes

D. About 13 minutes

E. None of the above

---

21. A town has an initial population of 70000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	70020	70040	70060	70080	70100	70120	70140	70160	70180

A. Non-Linear Power

B. Logarithmic

C. Exponential

D. Linear

E. None of the above

---

22. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 771 grams of element X and after 5 years there is 77 grams remaining.

A. About 730 days

B. About 365 days

C. About 1 day

D. About 2190 days

E. None of the above

---

23. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 200° *C and is placed into a* 18° *C bath to cool. After 25 minutes, the uranium has cooled to* 150° *C.*

A. $k = -0.03101$

B. $k = -0.03148$

C. $k = -0.01285$

D. $k = -0.01662$

E. None of the above

---

24. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $200°$ *C and is placed into a* $17°$ *C bath to cool. After 13 minutes, the uranium has cooled to* $156°$ *C.*

A. $k = -0.06027$

B. $k = -0.06113$

C. $k = -0.02799$

D. $k = -0.09902$

E. None of the above

---

25. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 741 grams of element X and after 7 years there is 82 grams remaining.

A. About 1095 days

B. About 3285 days

C. About 730 days

D. About 1 day

E. None of the above

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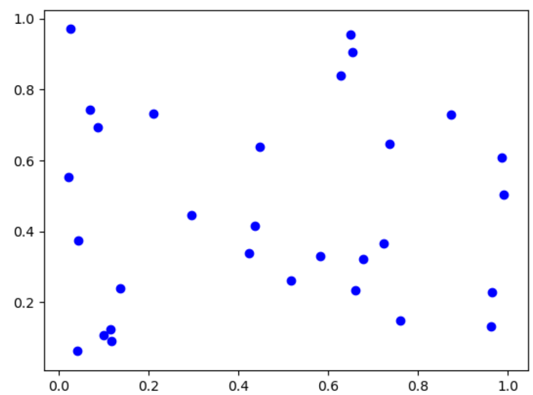
26. Determine the appropriate model for the graph of points below.



A. Linear model

B. Non-linear Power model

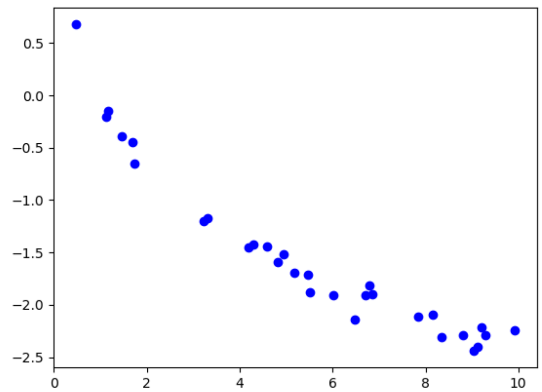
C. Exponential model

D. Logarithmic model

E. None of the above

---

27. Determine the appropriate model for the graph of points below.



A. Linear model

B. Exponential model

C. Logarithmic model

D. Non-linear Power model

E. None of the above

---

28. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 1 hours, the petri dish has 19 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 264 minutes

B. About 209 minutes

C. About 44 minutes

D. About 34 minutes

E. None of the above

---

29. A town has an initial population of 70000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	69950	69900	69850	69800	69750	69700	69650	69600	69550

A. Exponential

B. Linear

C. Non-Linear Power

D. Logarithmic

E. None of the above

---

30. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 2 bacteria-α. After 3 hours, the petri dish has 64 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

A. About 57 minutes

B. About 77 minutes

C. About 342 minutes

D. About 465 minutes

E. None of the above
